

SMART VACPREPTM

INTELLIGENT VACUUM SAMPLE PREPARATION SYSTEM



OPERATOR MANUAL

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(Rev A)

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CONTACT Us

Micromeritics Instrument Corporation

4356 Communications Drive
Norcross, GA / USA / 30093-2901
Phone: 1-770-662-3636
Fax: 1-770-662-3696
www.Micromeritics.com

Instrument Service or Repair

Phone: 1-770-662-3666
International: Contact your local distributor or call 1-770-662-3666
Service.Helpdesk@Micromeritics.com

Micromeritics Application Support

Support@Micromeritics.com

GENERAL SAFETY



Do not modify this instrument without the authorization of a Micromeritics service personnel.



Use caution in the areas where this symbol is displayed on the instrument — such as near the heating stations. These surfaces may be hot and could cause serious burns. Use the gloves supplied in the accessories kit.

Any piece of laboratory equipment can become dangerous to personnel when improperly operated or poorly maintained. All employees operating and maintaining Micromeritics instruments should be familiar with its operation and should be thoroughly trained and instructed on safety.

- Read the operator manual for any special operational instructions for the instrument.
- Know how the instrument functions and understand the operating processes.



- Wear the appropriate personal protective equipment when operating this instrument — such as eye protection, lab coat, protective gloves, etc.
- When lifting or relocating the instrument, use proper lifting and transporting devices for heavy instruments. Ensure that sufficient personnel are available to assist in moving the instrument. The Smart VacPrep weighs approximately 32 kg (70 lb).
- Always pay attention to the safety instructions provided on each label affixed to the instrument and do not alter or remove the labels. When inspecting the instrument, ensure that the safety labels have not become worn or damaged.
- The Smart VacPrep has a safety shield. Ensure it is in place when operating the instrument.
- Proper maintenance is critical to personnel safety and smooth instrument operation and performance. Instruments require regular maintenance to help promote safety, provide an optimum end test result, and to prevent costly down time. Failure to practice proper maintenance procedures can lead to unsafe conditions and shorten the life of the instrument.
- Improper handling, disposing of, or transporting potentially hazardous materials can cause serious bodily harm or damage to the instrument. Always refer to the MSDS when handling hazardous materials. Safe operation and handling of the instrument, supplies, and accessories is the responsibility of the operator.

INTENDED USE

The Smart VacPrep degasser is an advanced six-port system that utilizes vacuum to prepare samples by heating and evacuation. Each of the ports may be operated independently. Samples may be added or removed from degas ports without disturbing the treatment of other samples undergoing preparation. Degassing automatically terminates when the samples have completed all programmed steps.



The instrument is intended to be operated by trained personnel familiar with the proper operation of the equipment recommended by the manufacturer and as well as relevant hazards involved and prevention methods. Other than what is described in this manual, all use is seen as unintended use and can cause a safety hazard.



The instrument is intended to be used as per applicable local and national regulations.

TRAINING

It is the customer's responsibility to ensure that all personnel operating or maintaining the equipment participate in training and instruction sessions. All personnel operating, inspecting, servicing, or cleaning this instrument must be properly trained in operation and machine safety before operating this instrument.

ENVIRONMENTALLY FRIENDLY USE PERIOD

Hazardous Substances Table

| Part Name | Hazardous Substances | | | | | |
|----------------------------------|----------------------|--------------|--------------|-------------------------------|--------------------------------|---------------------------------------|
| | Lead (Pb) | Mercury (Hg) | Cadmium (Cd) | Hexavalent Chromium (Cr (VI)) | Polybrominated biphenyls (PBB) | Polybrominated diphenyl ethers (PBDE) |
| Cover | o | o | o | o | o | o |
| Power Supplies | x | o | o | o | o | o |
| Printed Circuit Boards | x | o | o | o | o | o |
| Cables, Connectors & Transducers | x | o | o | o | o | o |

o Hazardous substance is below the specified limits as described in SJ/T11363-2006.

x Hazardous substance is above the specified limits as described in SJ/T11363-2006.

The Environmentally Friendly Use Period (EFUP) for all enclosed products and their parts are per the symbol shown here unless otherwise marked. Certain parts may have a different EFUP (for example, battery modules) and are marked to reflect such. The Environmentally Friendly Use Period is valid only when the product is operated under the conditions defined in the product manual.



ABOUT THIS MANUAL

The following can be found on the Micromeritics web page (www.Micromeritics.com).

- Parts and Accessories
- Error Messages
- Vacuum Pump Guide (PDF)

The following symbols or icons indicate safety precautions and/or supplemental information and may appear in this manual:



NOTE — Notes contain important information applicable to the topic.



CAUTION — Cautions contain information to help prevent actions that may damage the analyzer or components.



WARNING — Warnings contain information to help prevent actions that may cause personal injury.



WARNING - SURFACE MAY BE HOT — Warnings contain information to help prevent actions that may cause personal injury. This symbol indicates that surfaces may be hot and may present dangers if touched.

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Table of Contents

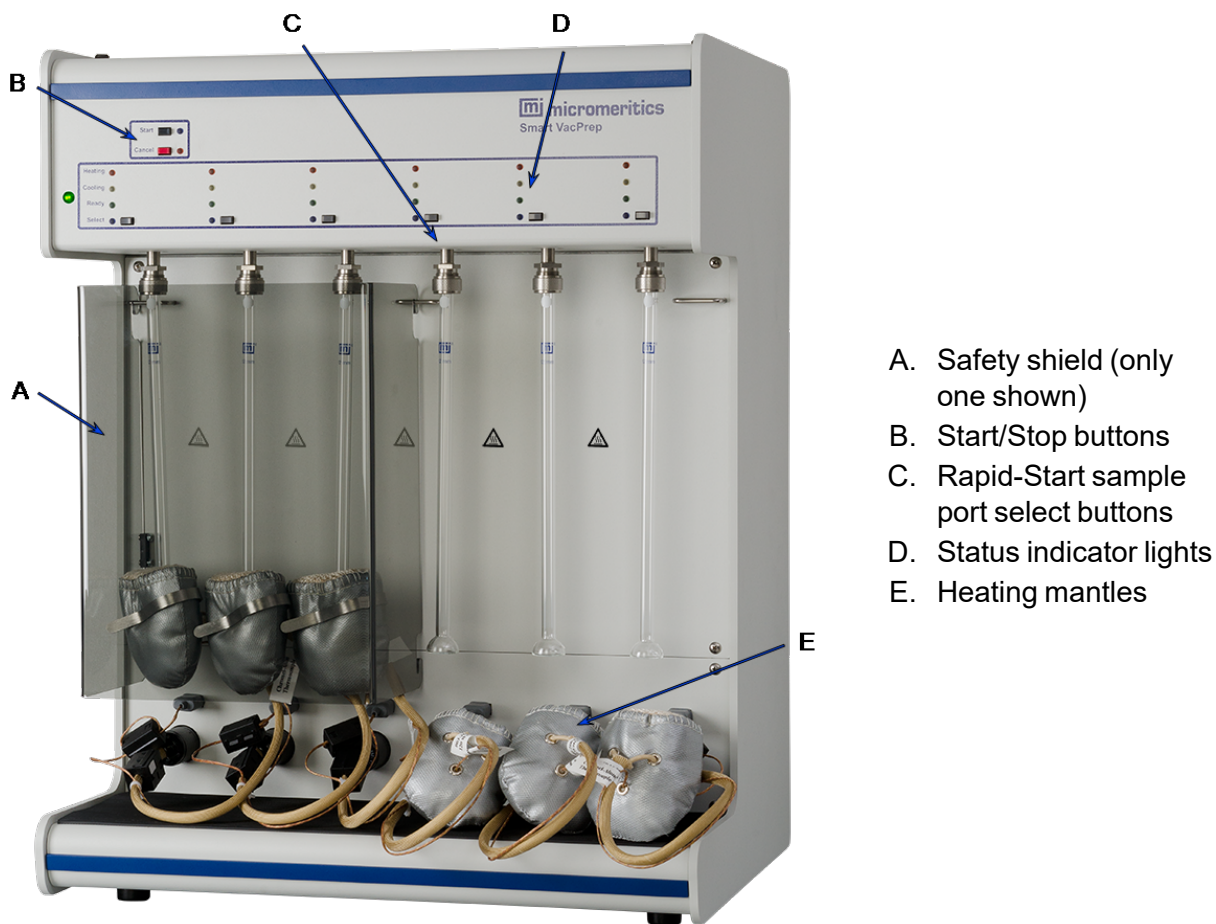
| | |
|--------------------------------------|---------------------|
| General Safety | <i>iv</i> |
| About this Manual | <i>vii</i> |
| 1 About the Smart VacPrep | <i>1 - 1</i> |
| Specifications for the Smart VacPrep | <i>1 - 3</i> |
| Check Seal and TranSeal | <i>1 - 6</i> |
| 2 About the Software | <i>2 - 1</i> |
| Common Fields and Buttons | <i>2 - 1</i> |
| Export Files | <i>2 - 2</i> |
| Instrument Status | <i>2 - 3</i> |
| Show Dashboard | <i>2 - 3</i> |
| Show Log | <i>2 - 5</i> |
| Show Schematic | <i>2 - 6</i> |
| Show Status | <i>2 - 8</i> |
| Keyboard Shortcuts | <i>2 - 9</i> |
| Libraries | <i>2 - 10</i> |
| List Files | <i>2 - 11</i> |
| Menu Structure | <i>2 - 11</i> |
| Smart VacPrep Configuration | <i>2 - 12</i> |
| Add or Remove a Smart VacPrep | <i>2 - 13</i> |
| Unit Selection | <i>2 - 14</i> |
| Software Setup | <i>2 - 14</i> |
| Software Uninstall | <i>2 - 15</i> |
| Software Updates | <i>2 - 15</i> |
| 3 Operate the Smart VacPrep | <i>3 - 1</i> |
| Start Degas | <i>3 - 1</i> |
| Evacuate Ports | <i>3 - 2</i> |
| Backfill Ports | <i>3 - 3</i> |
| QuickStart Degas Conditions | <i>3 - 4</i> |

| | |
|---|----------------|
| Load QuickStart Degas Conditions into a Sample File | 3 - 6 |
| 4 Calibration | 4 - 1 |
| Pressure Offset | 4 - 1 |
| Servo Valve | 4 - 2 |
| 5 Diagnostics | 5 - 1 |
| Diagnostic Test Report | 5 - 1 |
| 6 Maintenance | 6 - 1 |
| Safe Servicing | 6 - 2 |
| Parts And Accessories | 6 - 3 |
| Clean the Instrument | 6 - 3 |
| Enable Manual Control | 6 - 3 |
| Oil-based Vacuum Pump | 6 - 3 |
| Power | 6 - 3 |
| Preventive Maintenance | 6 - 4 |
| Guidelines for Connecting Gases | 6 - 5 |
| Replace a Gas Cylinder | 6 - 6 |
| Sample Tube Installation | 6 - 8 |
| Sample Tube for HPVA | 6 - 10 |
| Remove the Smart VacPrep Sample Port Fitting | 6 - 10 |
| Attach an HPVA Sample Tube to the Smart VacPrep | 6 - 11 |
| Smart VacPrep Fuse | 6 - 11 |
| 7 Data Logging | 7 - 1 |
| Data File Column Descriptions | 7 - 3 |
| Install Python Components | 7 - 4 |
| Sample Python Code | 7 - 5 |
| Smart VacPrep EU Declaration of Conformity | DoC - 1 |

1 ABOUT THE SMART VACPREP

The degas program may be started or terminated by using software installed on the computer attached to the analysis instrument or with buttons on the front panel of the Smart VacPrep. The *Rapid-Start* mode on each port allows the operator to attach the sample tube with heating mantle and immediately start degassing a sample.

The Smart VacPrep is compatible with the Flex, ASAP 2460, and TriStar II Plus.



Smart VacPrep Components

| Component | Description |
|--|--|
| Ethernet port (not shown) | Located on the left side panel. Use to connect an Ethernet switch. |
| Heating Mantles | Covers the bottom of the sample tube while degassing is in process. |
| Power Switch (not shown) | Located on the back of the unit. Powers the unit on or off. |
| Rapid-Start Sample Select buttons | Select the ports to be degassed. |
| Safety Shield | Place the safety shield over the sample tubes while the instrument is degassing. |
| Start/Stop buttons | Starts or stops the degas process on all ports where the <i>Select</i> indicator is lit. |
| Status Indicator lights | <p>Three lights indicate the current status of the station. The lights flash when the valves are open.</p> <p>Green. Indicates the station is idle and not hot. The setpoint temperature is below 30 °C and the actual temperature is below 50 °C.</p> <p>Red. Indicates when the setpoint temperature is greater than 30 °C and heat is being applied to the station.</p> <p>Yellow. Indicates the station is in use, but not currently being heated. The heating mantle may still be above 50 °C.</p> |

SPECIFICATIONS FOR THE SMART VACPREP

| | |
|-------------------|---|
| Backfill Options | Automatic |
| Capacity | 6 ports |
| Degas Method | Heat and vacuum |
| Evacuation Period | Determined by selected elapsed time after achievement of selected low pressure target |
| Evacuation Rate | Selectable evacuation rate from 1.0 to 50.0 mmHg/s |
| Hold Time | Zero to 999 minutes in one minute increments |
| Vacuum Control | Servo-controlled rates to minimize or eliminate sample elutriation |

Heating

| | |
|--------------------|---|
| Heating of Samples | Heating mantles |
| Ramp Rate | Selectable from 0.1 to 10 °C per minute |

Temperature

| | |
|----------|--|
| Accuracy | Deviation less than ± 10 °C at the sensing thermocouple embedded in the heating mantle |
| Control | One ramp during evacuation phase, five additional ramps during subsequent phases |
| Range | 40 to 450 °C in one degree increments |

Gases

| |
|---|
| Nitrogen, argon, or any other pure gas that does not adsorb at room temperature |
|---|

Environment

| | |
|------------------------------|---|
| Temperature | 10 to 35 °C operating; 0 to 50 °C non-operating Maximum rate of change of 2 °C per hour |
| Humidity | 20 to 80% relative, non-condensing |
| Indoor or Outdoor Use | Indoor only (not suitable for wet locations) Altitude: 2000 m max Pollution degree of the intended environment: 2 |
| Degree of Ingress Protection | IPX0 |


Electrical

| | |
|----------------------|--|
| Voltage | 100/120/230/240 VAC (acceptable mains supply voltage fluctuations: $\pm 10\%$ of rating) |
| Power | 750 VA |
| Frequency | 50/60 Hz |
| Overvoltage Category | II |

Physical

| | |
|--------|----------------|
| Height | 69 cm (27 in.) |
| Width | 53 cm (21 in.) |
| Depth | 43 cm (17 in.) |
| Weight | 32 kg (71 lbs) |

Computer Requirements

| | |
|---------------------------------------|---|
| Operating System | Windows 10 or higher operating system is required. |
| Desktop Installation Required | The application should not be installed on a network drive with shared access. |
| | Multiple users cannot operate the application at the same time. |
| Desktop Installation Required |  <p>Ensure the "Sleep" setting on the desktop is set to "Never" to avoid interruption while running an analysis. If this occurs, the application loses network connectivity with the instrument and a communications error will be reported. A restart of the Windows application may be required if automatic reconnection is not successful.</p> |
| | |
| 10 Base T or 100 Base T Ethernet Port | If the computer is to be connected to a network, two Ethernet ports are required. If more than one Ethernet-based unit is connected to the same computer, an Ethernet switch will also be required. |
| Read/Write Permissions | All application users will need Read/Write permission to all directories and subdirectories where the application is installed. |
| Drives | USB port |

Due to continuous improvements, specifications are subject to change without notice.

CHECK SEAL AND TRANSEAL

Parts and accessories are located on the [Micromeritics](https://www.micromeritics.com) web page.

Check Seas and TranSeals are available and can be used to transfer air-sensitive samples from the Smart VacPrep to the analyzer's port without atmospheric contamination. They are designed for use with the 1/2 in. and 12 mm sample tubes. Instructions for using the Check Seal or TranSeal are included with the ordered part.

The Smart VacPrep is shipped from the factory with Check Seal openers installed inside each sample tube port.

CheckSeal and TranSeal Information

| Sample Tube Size | Opener Removal Required | Assembly Available |
|-------------------------|--------------------------------|---------------------------|
| 1/4 in. | Yes | No |
| 3/8 in. | Yes | No |
| 1/2 in. | No | Yes |
| 9 mm | Yes | No |
| 12 mm | No | Yes |

2 ABOUT THE SOFTWARE

The Smart VacPrep software is installed as a part of the analyzer installation or it can be installed as a standalone unit. During installation, an IP address will be assigned to the unit allowing the unit to connect automatically during startup. Up to three additional degasser units can be installed when running Micromeritics analyzer analysis software.

COMMON FIELDS AND BUTTONS

The fields and buttons in the following table are located in multiple windows throughout the analyzer application and have the same description or function. Fields and button descriptions not listed in this table are found in tables in their respective sections. All entry fields will accept information when using a bar code reader.

Common Fields and Buttons

| Selections | Description |
|----------------------|--|
| Add Log Entry | Use to enter information that will display in the sample log report that cannot be recorded automatically through the application. Click the button again to enter multiple log entries. |
| Browse | Searches for a file. |
| Cancel | Discards any changes or cancels the current process. |
| Clear | Clears all fields. |
| Close | Closes the active window and displays a prompt to either accept or reject changes. |
| OK | Saves and closes the active window. |
| Save | Saves changes. |
| Start | Starts the operation or process. |

EXPORT FILES

File > Export

Provides the option to print the contents of one or more sample or parameter files to either the screen, a printer, or a file. Data can be exported as a .PDF, .TXT, .XML, or .XLS file format. The type of data to include or exclude can be selected during the export process. The data can be imported into other applications that read these file formats when exported to a file.

1. Select a .DEG file to be exported.
2. Click **Export** and select export preferences.

INSTRUMENT STATUS

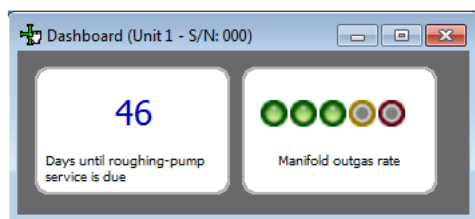
SHOW DASHBOARD

Prep [n] > Show Dashboard

The dashboard displays the following:

- Number of days until roughing pump maintenance is due
- Manifold outgas rate

Data for the dashboard comes from the logged diagnostic data. The dashboard is automatically kept current as the relevant diagnostic data items are updated. The gauges will be updated even if the dashboard window is not open.




Red numbers on the dashboard require attention. To reset the dashboard numbers, right-click on the dashboard setting, then click **Reset**.

Dashboard Gauges

| Selections | Description |
|--|---|
| Days until roughing-pump service is due | Annual maintenance is recommended. The number of days until the anniversary of the last pump maintenance is shown. The displayed value is updated at least once per day and when the maintenance time is reset. When the displayed value is 30 or less, the value is displayed in red. Red negative numbers display if maintenance is past due. |

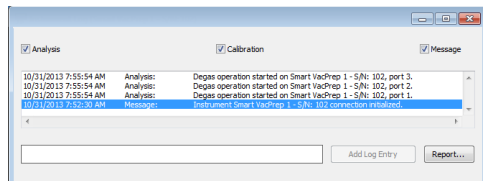
Dashboard Gauges (continued)

| Selections | Description |
|--|--|
| Manifold outgas rate | <p>Provides the qualitative indication of the outgas rate in the dosing manifold. LED images constitute a bidirectional bar graph of the outgas rate.</p> <p>The gauge is updated after each outgas rate measurement.</p> <ul style="list-style-type: none">■ Three green LEDs are lit if outgas rate is below 30% of outgas rate limit.■ At 30%, the left LED turns off.■ At 60%, the center LED turns off.■ At 90%, three green LED lights turn off and the center yellow LED is turned on.■ At 110% and above, only the red LED is lit and attention is required. |
|  Smart VacPrep fields and buttons not listed in this table; see Common Fields and Buttons on page 2 - 1. | |


SHOW LOG

Prep [n] > Show Log

Use to display a log of recent analyses, calibrations, or messages.



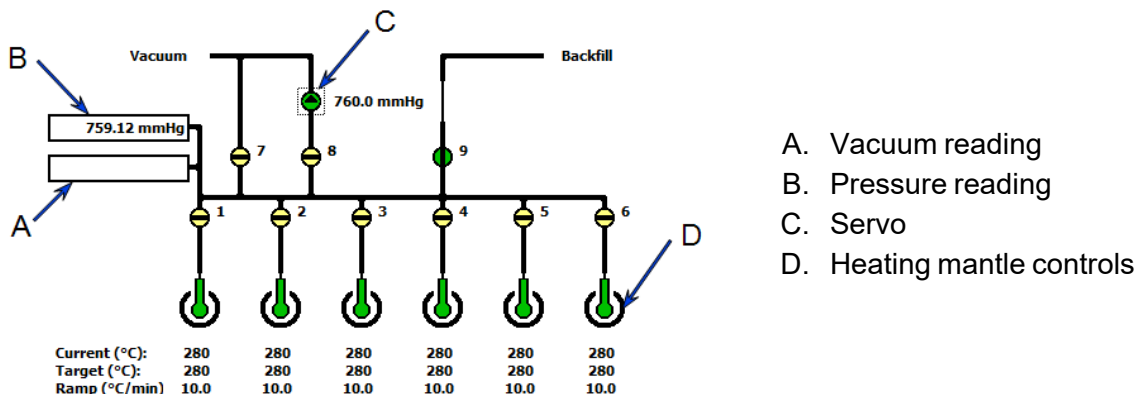
Log Fields

| Field | Description |
|--|-----------------------------|
| Analysis / Calibration / Message | Select the logs to display. |
|  Smart VacPrep fields and buttons not listed in this table; see Common Fields and Buttons on page 2 - 1. | |






SHOW SCHEMATIC

Prep [n] > Show Schematic

Use to display an analyzer schematic. To operate the valves and heating mantles from this window, manual control must be enabled (**Prep [n] > Enable Manual Control**).



Schematic Component Icons

| Selections | Description |
|---|---|
|  | Open Valve. Green indicates an open valve. |
|  | Closed Valve. Yellow indicates a closed valve. |
|  | Servo Valve. Closed. |
|  | Servo Valve. Open. |
|  | Sample Tube. Cannot be manually controlled. |

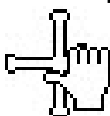

Schematic Components

| Schematic Components | Description |
|-------------------------|---|
| 1-6 | Sample port valves |
| 7, 8, 9 | Vacuum and backfill valves |
| Heating mantle controls | Sets the ramp rate and target temperature |

Schematic Shortcut Menus

Each manually controlled schematic component has a shortcut menu displaying the operations available for that particular component. To access the shortcut menu, hover the mouse pointer over the component and right-click.

Schematic Shortcuts

| Schematic Shortcut Icon | Available Options: |
|---|---|
| Valve options  | Close. Closes the selected valve. Open. Opens the selected valve. Set. Use to set the servo valve target pressure and dose or evacuate. |
| Temperature control options  | Disable. Select to disable the temperature control options for the selected port. Set. Select to set the following: <ul style="list-style-type: none"> ■ Enable or disable temperature control ■ Control sample temperature ■ Control furnace temperature ■ Cool the sample to less than 50 °C ■ Set heater power percent |


SHOW STATUS

Prep [n] > Show Status



The status window allows the monitoring of degas operations for a manual degas operation.

Status

| Selections | Description |
|--|---|
| Check | <p>Click to check the outgassing rate of the samples on the selected port. The following process occurs:</p> <ul style="list-style-type: none"> ■ The current degassing step is suspended. ■ The vacuum valves are closed and the vacuum level on the selected ports is monitored. ■ The <i>Status</i> window indicates that the degassing operation is being checked and displays the outgassing rate as it becomes available. <p>During the degas check, the Check button changes to Continue. When Continue is clicked, the valves open and the degassing operation resumes.</p> <p>If the outgassing rate indicated that the sample has been freed of contaminants (minimal pressure increases), click Skip to advance to the next state of the degassing operation. For example, if degassing is checked after the setpoint is attained, Skip advances to the ramping stage.</p> |
| Sample | The name of the sample file. |
| Skip | Skips the current degas operation. |
| Status | Indicates the current status of the degas. |
|  Smart VacPrep fields and buttons not listed in this table; see Common Fields and Buttons on page 2 - 1. | |

KEYBOARD SHORTCUTS

Shortcut keys can be used to activate some menu commands. Shortcut keys or key combinations (when applicable) are listed to the right of the menu item.

Certain menus or functions can also be accessed using the **Alt** key plus the underlined letter in the menu command. For example, to access the *File* menu, press **Alt + F**, then press the underlined letter on the submenu (such as pressing **Alt + F**) then pressing **O** to open the *File Selector*).



If the underscore does not display beneath the letter on the menu or window, press the **Alt** key on the keyboard.

Keyboard Shortcuts

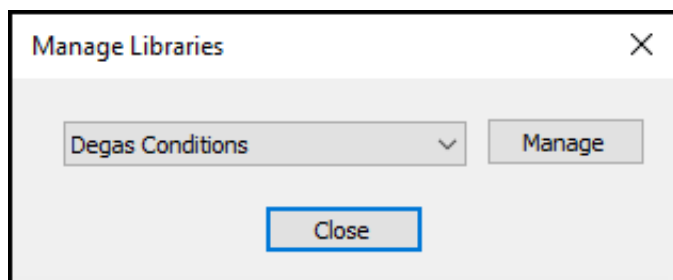
| Selections | Description |
|-------------------|---|
| Alt + F | Opens the <i>File</i> menu. |
| Alt + F4 | Exits the program. If files are open with unsaved changes, a prompt to save changes displays. |
| Alt + H | Opens the <i>Help</i> menu. |
| Alt + I | Opens the <i>Options</i> menu. |
| Alt + W | Opens the <i>Window</i> menu. |
| Ctrl + O | Opens the <i>File Selector</i> window. |
| Ctrl + S | Saves the open file. |
| F1 | Opens the online help operator manual. |
| F2 | Opens the <i>File Selector</i> window. |
| F6 | Cascades open windows. |
| F7 | Tiles all open application windows. |
| Shift + F2 | Opens the <i>File List</i> window. |

LIBRARIES

Options > Manage Libraries



This feature is not available when using *Restricted* option presentation.



The library provides an easy way to locate and open specific analyzer files. Libraries are located within the *File Selector* window and can be viewed only within the application.

The library gathers sample and parameter files stored in multiple locations, such as folders on a C: drive, a network location, a connected external hard drive, or a connected USB flash drive, and provides access to all files. Even though libraries do not store actual sample and parameter files, folders can be added or removed within each library.

One library can include up to 50 folders. Other items, such as saved searches and search connectors, cannot be included.

When *removing* a folder from a library, the folder and its contents are not deleted from the original file storage location. However, when *deleting* files or folders from within a library, they are deleted from their original file storage location. Deleted files and folders can be recovered from the Recycle Bin located on the Windows desktop.

LIST FILES

File > List

Provides the option to create a list of sample file information —such as file name, date, time the file was created or last edited, file identification, and file status.

Select one or more files from the file selector, click **List**, then provide the file destination.

| No. | File Name | File Listing | | Description | Status |
|-----|--|--------------|------------|--|----------|
| | | Date | Time | | |
| 1 | 13x with CO2 at 0C Port 1B.SMP | 8/10/2020 | 3:53:54 PM | 13x with CO2 Port 1 | Complete |
| 2 | 13x with CO2 at 0C Port 2B.SMP | 8/10/2020 | 3:53:54 PM | 13x with CO2 Port 2 | Complete |
| 3 | 13x with CO2 at 0C Port 3B.SMP | 8/10/2020 | 3:53:54 PM | 13x with CO2 Port 3 | Complete |
| 4 | 13x with N2 and TranSeal Port 2.SMP | 8/10/2020 | 3:53:54 PM | 13X Zeol Tube 2 w/ FS @ end of analysis, Port 2 | Complete |
| 5 | 13x with N2 and TranSeal Port 3.SMP | 8/10/2020 | 3:53:54 PM | 13X Zeol Tube 1A w/ FS @ end of analysis, Port 3 | Complete |
| 6 | Activated Carbon with Butane C3 Port 1.SMP | 8/10/2020 | 3:53:55 PM | Activated Carbon Tube C3 Butane Port 1 | Complete |
| 7 | Activated Carbon with Butane C4 Port 3.SMP | 8/10/2020 | 3:53:55 PM | Activated Carbon Tube C4 Butane Port 3 | Complete |

**Example of
File List**

MENU STRUCTURE

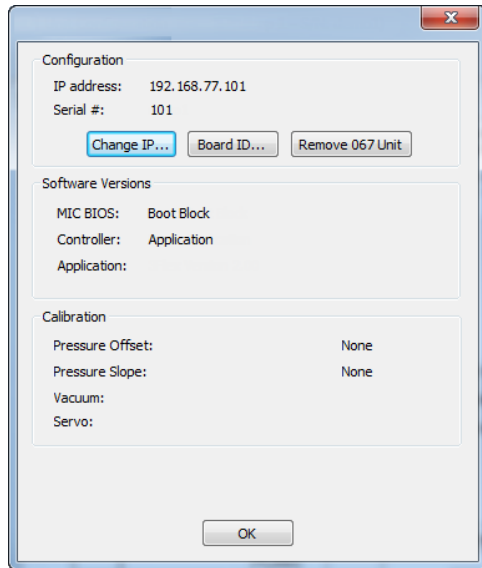
All program functions use standard Windows menu functionality. The title bar contains a *Prep [n]*. If multiple Smart VacPreps are installed, ensure the appropriate unit is selected before continuing.

Main Menu Bar Options

| Option | Description |
|-----------------|--|
| File | Use to add or remove Smart VacPreps and manage files. |
| Prep [n] | Use to degas, perform calibrations, diagnostics, and other degasser operations. |
| Options | Use to edit units and manage the library. |
| Window | Use to manage open windows and display a list of open windows. A checkmark appears to the left of the active window. |
| Help | Provides access to the embedded operator manual, the Micromeritics web page (www.Micromeritics.com), and information about the application. |


SMART VACPREP CONFIGURATION

Prep [n] > Configuration



Displays the Smart VacPrep configuration and software versions.

Unit Configuration

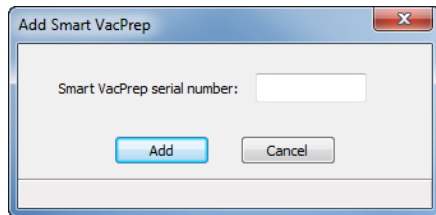
| Selections | Description |
|--|--|
| Board ID [button] | Click to display the board ID. This button is disabled if the instrument is busy. |
| Change IP [button] | Click to display the <i>Unit IP Setup</i> window. Use to change the IP address and subnet mask assigned during installation. Do not edit these fields unless instructed by a Micromeritics Service Representative. |
| Remove 067 Unit [button] | Click to remove the selected Smart VacPrep unit. |
|  Smart VacPrep fields and buttons not listed in this table; see Common Fields and Buttons on page 2 - 1. | |

ADD OR REMOVE A SMART VACPREP

A Smart VacPrep unit must be removed from one application before it can be added to another application if they are running on the same subnet.

Add a Smart VacPrep

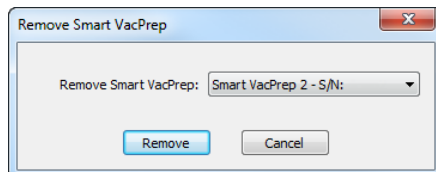
File > Add Smart VacPrep



1. When prompted, enter the serial number of the unit being added. Duplicate serial numbers are not allowed.
2. Click **Add**. Initialization begins.

Remove a Smart VacPrep

File > Remove Smart VacPrep

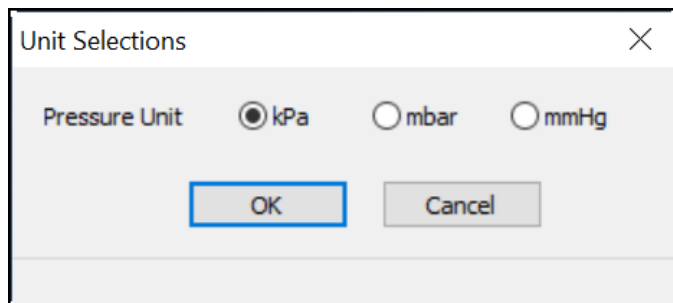


1. Select the serial number to remove.
2. Click **Remove**.

UNIT SELECTION

Options > Units

Use to specify how data should appear on the application windows and reports. This menu option is not available if using *Restricted* option presentation in a standard installation environment.



SOFTWARE SETUP



If the computer is to be connected to a network, a second Ethernet port on the computer must be used for that purpose.

The *Setup* program is located on the installation media and is used to reinstall the software and make analyzer changes — such as adding, moving, or removing a unit, etc.



If the IP address needs to be changed on the computer connected to the analyzer, refer to the computer's operating system manual or the internet for instructions. The IP address for the computer and the IP address specified in the setup program must match. The IP address must be 192.168.77.100.

SOFTWARE UNINSTALL

The software can be uninstalled in two ways. Either method removes only the files required to run the software, not the analysis files.

- Click the Windows *Start* icon. Scroll to the Micromeritics entry. Select the *Uninstall [analyzer]* option, then follow the prompts.
- Locate the *uninstall.exe* file in *C:\Program Files (x86)\Micromeritics\[analyzer name]* (or wherever the application was installed). Double-click the *uninstall.exe* file, then follow the screen prompts.

SOFTWARE UPDATES



A User Account Control in the Windows operating system must be enabled to ensure all components of the Micromeritics application are correctly installed. If UAC is not enabled, right-click the *setup.exe* installer file and select *Run as administrator*.

The most current version of the instrument software can be found on the Micromeritics web page (www.Micromeritics.com).

When performing a software update, existing data files are not overwritten.

Insert the setup media into the media drive. The setup program starts automatically. If the program does not start automatically, navigate to the installation media drive, locate and double-click the *setup.exe* file.

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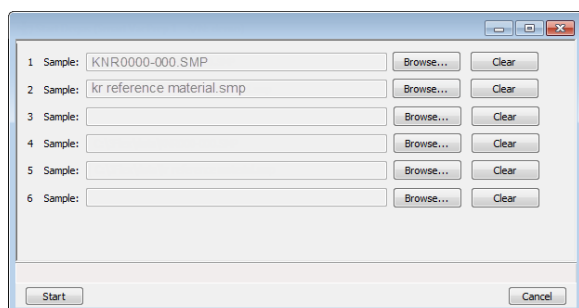
3 OPERATE THE SMART VACPREP

START DEGAS

Prep [n] > Start Degas

Parts and accessories are located on the [Micromeritics](https://www.micromeritics.com) web page.

This option allows the degassing of up to six samples simultaneously. A sample can be added to any idle port and a degas operation started. When adding a sample, the degas operation in progress will be suspended until the sample reaches the target pressure, then degassing on all ports will resume. If other samples are still in the initial evacuation phase, the new samples will wait until the fast evacuation is started. Samples can be removed from any of the six ports without disturbing the degas operations already in process. Starting several samples as a batch allows them to perform the initial evacuation at the same time.



Degas conditions remain the same from degas to degas unless the *Degas Conditions* file is changed or replaced by the operator. A manual evacuation can be performed on any idle degas port. The six ports are represented by row numbers. Ports that are busy are grayed out and disabled.

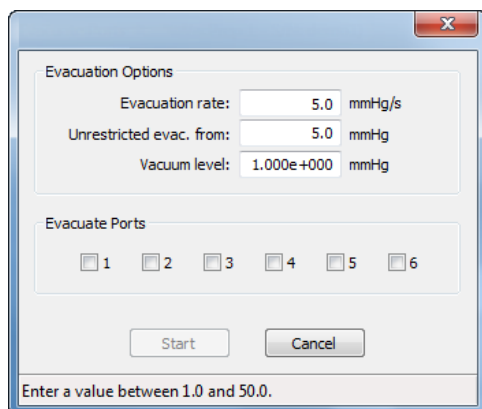
1. Open a .SMP or .DEG file for each Smart VacPrep port to be used. If using the Check Seal, see the instructions included with the Check Seal [part number 350-42802-00].
2. Load the sample into the sample tube. If using a Check Seal or TranSeal on a 1/2 in. or 12 mm sample tube, insert it into the sample tube.
3. Load the sample tube on the Smart VacPrep sample port.
4. Attach the heating mantle using the metal clip. If a straight wall tube is used, heating mantles with elastic cords are available.
5. Install the safety shield.
6. Click **Start** on the *Start Degas* window to begin the degas process for the selected Smart VacPrep ports.
7. Click **Start** to begin the degas process for the selected Smart VacPrep ports.
8. Allow the samples to cool before transferring them to the analysis ports to start the analysis.




Degas ports can also be canceled using buttons on the Smart VacPrep unit. Press **Select** on the unit to select the port, then press the **Cancel** button.

EVACUATE PORTS

Prep [n] > Evacuate Ports



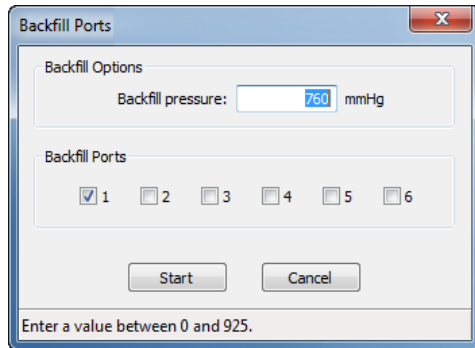
Evacuate Ports

| Selections | Description |
|---|---|
| Evacuation Options [group box] | <p>Evacuation rate. The maximum rate of change of pressure when evacuating the sample tube.</p> <p>Unrestricted evac. from. Pressure at which the unrestricted evacuation is to begin.</p> <p>Vacuum level. Evacuation time starts when the vacuum level is reached.</p> |
| Evacuate Port[s] [group box] | Select the ports to evacuate. |
|  | <p>Smart VacPrep fields and buttons not listed in this table; see Common Fields and Buttons on page 2 - 1.</p> |

BACKFILL PORTS

Prep [n] > Backfill Ports

Use to backfill ports with gas.



1. Enter the backfill pressure in the *Backfill pressure* field.
2. Select the ports to be backfilled.
3. Click **Start** to start the process or **Cancel** to stop the process.

QUICKSTART DEGAS CONDITIONS

Prep [n] > QuickStart Degas Conditions

Use to enter commonly used degas conditions for each Smart VacPrep port without the need for a sample file. Degassing can then be started using the front panel buttons on the Smart VacPrep unit.

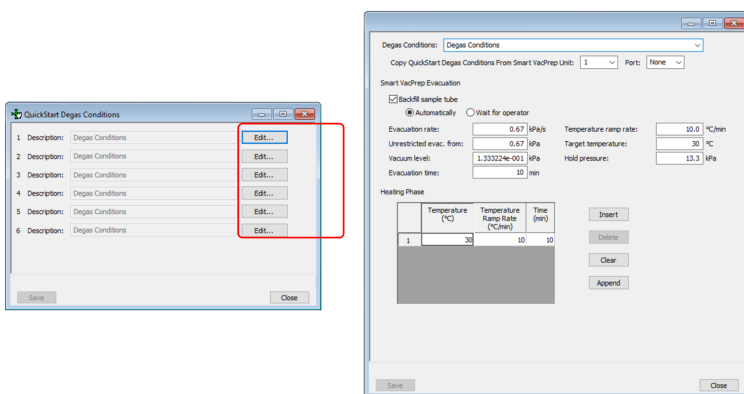
This option provides three ways to load information into *QuickStart Degas Conditions*:

- Load degas conditions from an existing degas conditions file.
- Copy conditions from another Smart VacPrep unit and port.
- Enter degas conditions manually.

Degas conditions can be copied into sample files after degassing for record keeping.

When using the *QuickStart* menu option, the degas process is started using the **Select** button and **Start** buttons for each port on the Smart VacPrep unit.

QuickStart degas conditions are remembered for the next button operation.



1. Click **Edit** for the port to be configured. The six ports are represented by row numbers. Ports that are busy are grayed out and disabled.

2. Enter degas conditions using one of the following methods:
 - To select degas conditions from a Degas Conditions file, click the drop-down arrow to the right of the *Degas Conditions* field. If the file is not shown, select *Browse*, locate the file, then click **Load**.
 - To copy QuickStart Degas Conditions from another Smart VacPrep, select the unit and port number to the right of the *Copy QuickStart Degas Conditions from Smart VacPrep Unit* field.
 - To enter degas conditions manually, complete the fields on the window. See the *Degas Conditions* section of the analyzer operator manual
3. Click **Save**. Repeat these steps for each port to be configured. If multiple ports will have the same degas conditions parameters, click **Edit** on the port and use the *Copy QuickStart Degas Conditions from Smart VacPrep Unit [n] Port [n]* field to load the settings from the first port.
4. Repeat these steps for each applicable unit and port.
5. If using the Check Seal, see the instructions included with the Check Seal [part number 350-42802-00]. For 1/4 in., 3/8 in., and 9 mm sample tubes, the CheckSeal opener must be removed in order to install the correct size sample tube.
6. Load the sample into the sample tube. If using a Check Seal or TranSeal, insert it into the sample tube.
7. Load the sample tube on the Smart VacPrep sample port.
8. Attach the heating mantle using the metal clip. If a straight wall tube is used, heating mantles with elastic cords are available.
9. Install the safety shield.
10. Press the **Select** button for the port to be degassed. A blue LED is lit.
11. Press the **Start** button on the Smart VacPrep panel to start the degas process for all ports that have a blue LED lit.
12. When degassing is complete and the sample has cooled, the sample can be transferred to an analysis port.


LOAD QUICKSTART DEGAS CONDITIONS INTO A SAMPLE FILE

QuickStart Degas Conditions can be copied into a sample file. See the *Degas Conditions* section of the analyzer operator manual.

Degas Conditions

| Selections | Description |
|---|--|
| Copy QuickStart degas conditions from Smart VacPrep Unit [drop-down box] | Use to copy the degas conditions settings from the selected Smart VacPrep unit and port. |
| Degas conditions [drop-down box] | Use to browse for a .DEG file that contains degas condition parameters to be used in the analysis. |
| Heating Phase [table] | <p>This option is applicable when degassing with a Smart VacPrep.</p> <p>Enter up to five stages of degas conditions.</p> <p>Temperature. Temperature at which the sample is to be held while degassing.</p> <p>Time. How long the sample is to be held at the specified temperature before beginning to cool down.</p> <p>Temperature Ramp Rate. The rate at which the temperature will change while advancing to the hold temperature.</p> |
| Smart VacPrep Evacuation [group box] | <p>Backfill sample tube. Indicate if the sample tube should be backfilled automatically or wait for operator response.</p> <p>Evacuation rate. Rate used for evacuation.</p> <p>Evacuation time. Length of time for preliminary evacuation before proceeding with the <i>Heating Phase</i> temperature schedule. The timer starts when the vacuum level is reached.</p> <p>Hold pressure. Pressure at which heating will stop and hold the sample temperature approximately constant until the pressure falls below the <i>Hold</i> pressure. This prevents damage to the sample structure due to 'steaming' and /or elutriation due to excessive escaping gas velocity.</p> <p>Target temperature. Targeted temperature for evacuation.</p> <p>Temperature ramp rate. Rate at which the temperature is to change when advancing to the target pressure.</p> |

Degas Conditions (continued)

| Selections | Description |
|---|--|
| | <p>Unrestricted evac. from. Pressure at which the unrestricted evacuation is to begin.</p> <p>Vacuum level. Evacuation time starts when the vacuum level is reached.</p> |
|  | <p>Smart VacPrep fields and buttons not listed in this table; see Common Fields and Buttons on page 2 - 1.</p> |

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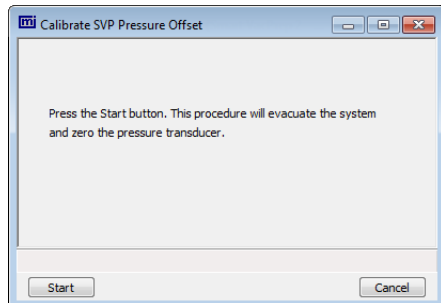
4 CALIBRATION

Prep [n] > Calibration

Various calibration procedures and service tests are included in the operating program. These procedures and tests are designed to provide a Service Representative with instrument readouts, as well as to assist in troubleshooting potential problems.

PRESSURE OFFSET

Prep [n] > Calibration > Pressure Offset



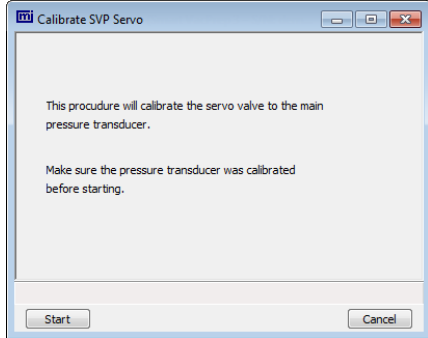
Use to perform system calibration. This option evacuates the system and zeros the pressure transducer.

Disabled calibration options can be accessed only with the assistance of an authorized Micromeritics Service Representative.

Click **Start** to begin the process.

SERVO VALVE

Prep [n] > Calibration > Servo Valve



Use to calibrate the servo valve to the manifold pressure transducer. The servo valve should always be recalibrated after a pressure calibration has been performed. The pressure transducer should be calibrated before starting this calibration procedure.

Click **Start**. The window closes when the calibration is complete. Click **Cancel** to stop the calibration process.

5 *DIAGNOSTICS*

Diagnostics should only be performed by qualified service personnel.

DIAGNOSTIC TEST REPORT

Prep [n] > Diagnostics > Diagnostic Test Report

Displays previously run diagnostic service tests. Separate directories store tests run once, daily, weekly, and monthly. Diagnostic test report files have a .SVT file extension and are stored in the ...\\Service directory.

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6 MAINTENANCE

The analyzer has been designed to provide efficient and continuous service; however, certain maintenance procedures should be followed to obtain the best results over the longest period of time. When unexpected results occur, some common operational problems not indicated on the window and their respective causes and solutions are provided.

The following can be found on the Micromeritics web page (www.Micromeritics.com).

- Error Messages document (PDF)
- Parts and Accessories
- Vacuum Pump Guide (PDF)



Improper handling, disposing of, or transporting potentially hazardous materials can cause serious bodily harm or damage to the instrument. Always refer to the MSDS when handling hazardous materials. Safe operation and handling of the instrument, supplies, and accessories is the responsibility of the operator.



Do not modify this instrument without the authorization of a Micromeritics service personnel.



When lifting or relocating the instrument, use proper lifting and transporting devices for heavy instruments. Ensure that sufficient personnel are available to assist in moving the instrument. The Smart VacPrep weighs approximately 32 kg (70 lb).



Use of a power cord or power supply not provided with the instrument could cause personal injury or damage to the equipment. If a replacement is needed, contact your Micromeritics Service Representative. Detachable power supply cords with an inadequate rating could cause significant instrument damage or physical harm.

Do not add anything between the power cord and the power source that would compromise the earth ground.

Do not remove or disable the grounding prong on the instrument power cord.

If the equipment needs to be relocated, check with your Micromeritics service representative. The equipment must be positioned such that the mains supply is not obstructed and is easily accessible to disconnect the equipment from the AC main power supply.



Prior to moving the instrument, disconnect and remove all glassware from the instrument. Ensure all gas shut-off valves on the gas cylinder have been closed and gas lines disconnected from the instrument. Contact your Micromeritics Service Representative.

SAFE SERVICING



Do not modify this instrument without the authorization of a Micromeritics service personnel.

To ensure safe servicing and continued safety of the instrument after servicing, service personnel should be aware of the following risks:

Product specific risks that may affect service personnel:

- **Electrical.** Servicing or repair could require opening the outer panels and exposing energized electrical components.
- **Heating stations.** Ensure the heating stations are cool and sample tubes have been removed from all stations. Heating stations can be very hot. Allow the heating stations to cool prior to servicing.



Use caution in the areas where this symbol is displayed on the instrument — such as near the heating stations. These surfaces may be hot and could cause serious burns. Use the gloves supplied in the accessories kit.

Protective measures for these risks:

- **Electrical.** The majority of electrical components operate at low voltage (24V or less) and pose low risk when energized. Maintenance, troubleshooting, and repairs should be performed with the instrument de-energized whenever possible, in accordance with standard electrical safety guidelines.
- **Fuses.** Use of improperly rated fuses could cause damage to the equipment.
- Sample tubes must be removed prior to repair.
- Power off and unplug the degasser from the power outlet prior to servicing.

Verification of the safe state of the instrument after repair:

- Sample tubes must be removed to prevent accidental breakage.
- Gas lines connected and pressurized to normal operating pressure with no leaks.

PARTS AND ACCESSORIES

Parts and accessories are located on the [Micromeritics](#) web page.

CLEAN THE INSTRUMENT

The exterior casing of the instrument may be cleaned using a clean, lint-free cloth dampened with isopropyl alcohol (IPA), a mild detergent, or a 3% hydrogen peroxide solution. Do not use any type of abrasive cleaner. It is not necessary to remove knobs, screws, etc. while cleaning.



Do not allow liquid to penetrate the casing of the instrument. Doing so could result in damage to the unit.

ENABLE MANUAL CONTROL

Prep [n] > Enable Manual Control

Use to enable the manual control of certain valves and heating mantles. When this option is enabled, a checkmark appears to the left of *Enable Manual Control* on the drop-down menu.

If the schematic is not immediately visible, go to *Prep [n] > Show Schematic*.

OIL-BASED VACUUM PUMP

The *Vacuum Pump Guide* can be found on the Micromeritics web page (www.Micromeritics.com).

POWER

The Smart VacPrep is designed to operate with line voltage of 100/120/230/240VAC ± 10 , 50/60 Hz through a standard wall receptacle. Noise-free power of the correct voltage and frequency, with a safety earth ground, should be available through a standard wall receptacle. There should be a minimum 15A rated breaker @ 100/120 VAC and a minimum 7.5A @ 240 VAC.



The analyzer and peripheral devices **must** be installed on their own dedicated power line. Other devices — such as motors, generators, or ovens — **should not** be placed on the same power line.



Replacement power supply cords must be rated for the specifications stated above.

PREVENTIVE MAINTENANCE

Perform the following preventive maintenance procedures to keep the analyzer operating at peak performance. Micromeritics also recommends that preventive maintenance procedures and calibration be performed by a Micromeritics Service Representative every 12 months.

| Maintenance Required | Frequency |
|---------------------------------|---|
| Instrument exterior | Clean as needed or every 6 months. |
| Port filters and O-rings | Replace every 3 to 6 months. |
| Port gasket | Replace every 3 to 6 months (depending on the types of analyses that were run). |
| Sample tube O-ring | Replace as required or every 3 to 6 months. |
| Vacuum pump | Reference the vacuum pump guide. |

GUIDELINES FOR CONNECTING GASES



These instructions refer to the installation of a gas line, regulator, and gas cylinder for each type of gas used. Expansion kits or other accessories may be used in the lab. If so, special consideration should be given to these configurations when installing the gas lines.



Improper handling, disposing of, or transporting potentially hazardous materials can cause serious bodily harm or damage to the instrument. Always refer to the MSDS when handling hazardous materials. Safe operation and handling of the instrument, supplies, and accessories is the responsibility of the operator.

- Place gas cylinders within 6 feet (2 m) of the gas inlets of the analyzer. Place the cylinders close enough to allow for proper connection at the analyzer inlet.

Using gas line extenders on gas cylinders located in remote areas may degrade gas quality and reduce pressure. Gas lines are typically five to six feet long.

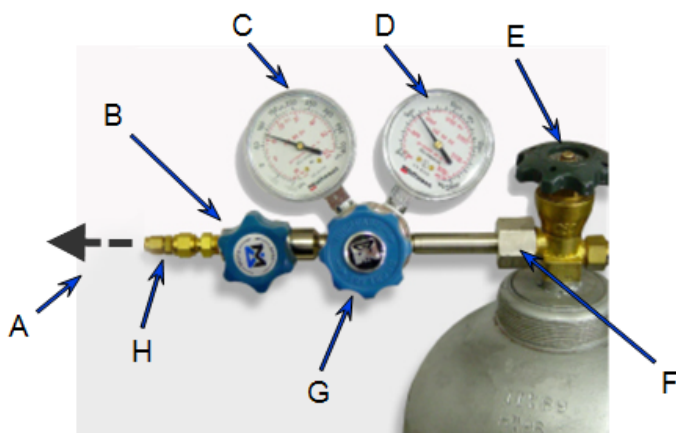
Long gas lines, such as those used with gas cylinders placed in remote areas, must be evacuated for an extended period of time to remove ambient gases. When possible, avoid placing gas cylinders in remote locations. It is always best to have gas cylinders located near the analyzer.

- Use a retaining strap (or other appropriate tether) to secure the gas cylinder.
- Always use the gas lines provided with the analyzer. It is very important that proper gas lines are used with the analyzer.
 - **Do not use** polymer tubing for the gas line.
 - **Do not use** flexible gas lines. Some flexible lines may appear to be appropriate, such as those with a herringbone covering, but the line may be coated internally with a polymer.
- Carefully route the gas lines from the cylinder to the analyzer avoiding overlapping or entangling gas lines. This will help avoid confusion when maintenance is required.
- Label the gas line at the analyzer inlet for proper identification and maintenance.
- Replace gas cylinders before gas is depleted. It is best to replace a gas cylinder when the pressure reads approximately 500 psi (3500 kPa) on the high-pressure gauge. Contaminants absorbed to the walls of the cylinder will desorb as the pressure decreases.
- Ensure the gas cylinder is closed before connecting to the analyzer.

REPLACE A GAS CYLINDER



A power failure or loss of cryogen can result in dangerous pressures in the sample chamber. When using toxic or flammable gases, additional venting of the cabinet may be required.



- A. Gas tubing to instrument
- B. Gas regulator shut-off valve
- C. Low pressure gauge
- D. High pressure gauge
- E. Gas cylinder shut-off valve
- F. Regulator connector nut
- G. Regulator control knob
- H. Brass reducer fitting

Disconnect a Depleted Gas Cylinder

1. Close the regulator shut-off valve and gas cylinder shut-off valve by turning the knobs clockwise.
2. Disconnect the gas line from the regulator. Gas will be vented from the line. It is not necessary to disconnect the gas line from the analyzer inlet if the cylinder will be replaced immediately with one of the same type.
3. Open the gas regulator shut-off valve by turning the knob counterclockwise. Gas will be vented from the regulator.
4. Turn the regulator control knob clockwise to open and vent any remaining gas. Both gauges should read at or near zero. If not, make sure the gas regulator shut-off valve is open.
5. Close the regulator by turning the control knob counter-clockwise.
6. Use an appropriate wrench to loosen the nut at the regulator connector nut then remove the regulator from the cylinder.
7. Replace the protective cap on the depleted cylinder. Disconnect the retaining strap and move the cylinder to an appropriate location.

Connect a Gas Cylinder**Regulator Pressure Settings**

| Analyzer | Gauge should indicate |
|----------------------|------------------------------|
| Smart VacPrep | 10 - 15 psig (69 - 103 kPag) |



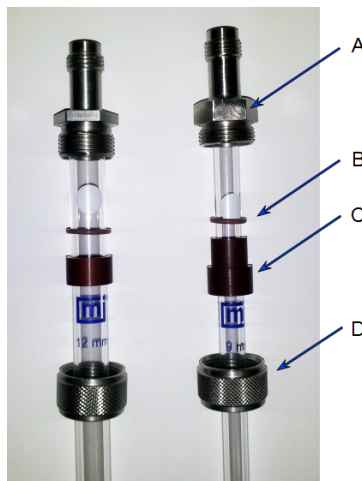
Exceeding the maximum recommended air pressure could cause personal injury or damage the instrument.

SAMPLE TUBE INSTALLATION



If using an HPVA instrument, see [Sample Tube for HPVA on page 6 - 10](#) for instructions on converting the Smart VacPrep to accommodate the HPVA sample tubes.

1. While holding the degas port plug, turn the connector nut counter-clockwise to loosen. Remove both the plug and the nut.

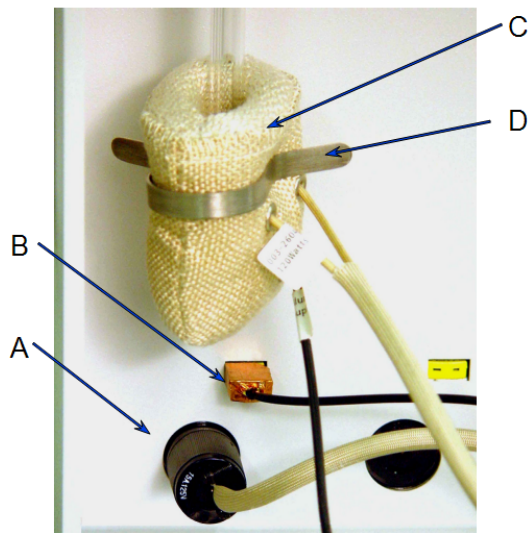


- A. Port fitting
- B. O-ring
- C. Ferrule
- D. Connector nut

Port plug

2. If using a rubber stopper, remove it from the sample tube. If using a Check Seal or TranSeal, do not remove them from the sample tube.
3. Place the port connector nut, ferrule, and O-ring onto the sample tube. If using the Check Seal, see the instructions included with the Check Seal [part number 350-42802-00].
4. To attach the sample tube set to the degas port fitting, push the sample tube in to a full stop.
5. Secure the sample tube in place by sliding the connector nut, ferrule, and O-ring up onto the degas port fitting and turning the connector nut clockwise. Tighten the nut securely by hand.

6. If available, place a heating mantle over the sample tube and secure the mantle in place with a mantle clip if a heating mantle is available.



- A. Power plug
- B. Thermocouple plug
- C. Heating mantle
- D. Mantle clip

7. Insert the heating mantle thermocouple plug into the thermocouple connector.
8. Insert the heating mantle power plug into the power connector and twist the power plug to lock securely.
9. After installing the sample tubes, install the safety shield around the sample tubes and heating mantles to minimize the risk of receiving a burn by touching hot components.

SAMPLE TUBE FOR HPVA

When using the Smart VacPrep attached to an HPVA instrument, the sample port fittings must be changed to accommodate the HPVA sample tubes.

REMOVE THE SMART VACPREP SAMPLE PORT FITTING

1. Use a 3/4 in. open-end wrench to turn the Smart VacPrep degas port connector nut counter-clockwise. Remove the Smart VacPrep port adapter and store for future use.



2. Remove the two plastic end protective covers from the VCO to ASAP adapter [part number: P02-25874-00].



3. Place a Seal Frit in the long end of the VCO adapter.



4. Insert the long end of the Fitting VCO adapter into the Smart VacPrep degas port. Hand tighten the connector nut by turning the adapter clockwise. Tighten again with a 3/4 in. wrench. Do not overtighten.



ATTACH AN HPVA SAMPLE TUBE TO THE SMART VACPREP

Refer to the HPVA Operator Manual [part number P02-42806-00] for detailed instructions on attaching the HPVA sample tube to the Smart VacPrep.

SMART VACPREP FUSE

Although the power entrance appears to need fuses, they have been superseded by the circuit breaker. Fuses are therefore not necessary.

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7 DATA LOGGING

The Smart VacPrep has the added capability to collect real time transient data (pressure, vacuum level, time, and temperatures) during sample degas when connected to the Flex analyzer or ASAP 2020 analyzer.

This document provides:

- installation instructions for the PuTTY client and outlines how to access and use the data file, and
- installation instructions for Python components and outlines how the captured data can be handled using Python scripts.

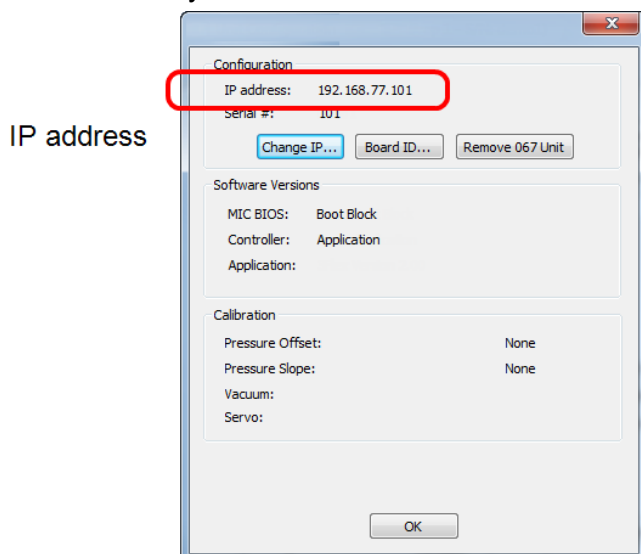
INSTALL THE PUTTY CLIENT

PuTTY is an open source SSH and telnet client that can be used to access the transient data output by the Flex or ASAP 2020 analyzer. No additional Micromeritics application is required. The PuTTY.exe file runs directly from a desktop shortcut. Download the PuTTY application using the following URL (only save the *putty.exe* file):

<http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>

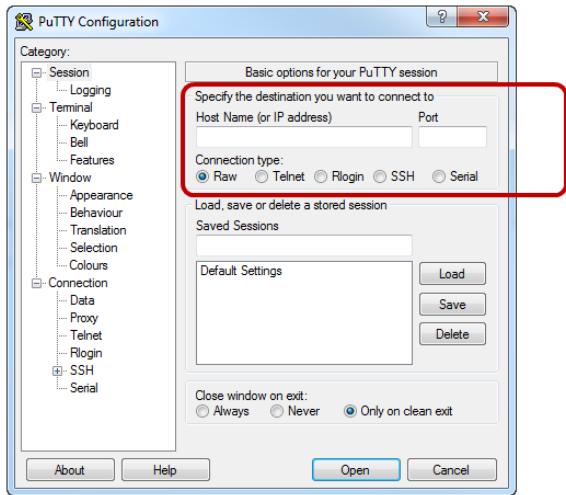
To connect to the analyzer:

1. In the Flex or ASAP 2020 application, go to **Unit [n] > Unit Configuration** and make a note of the analyzer IP address.

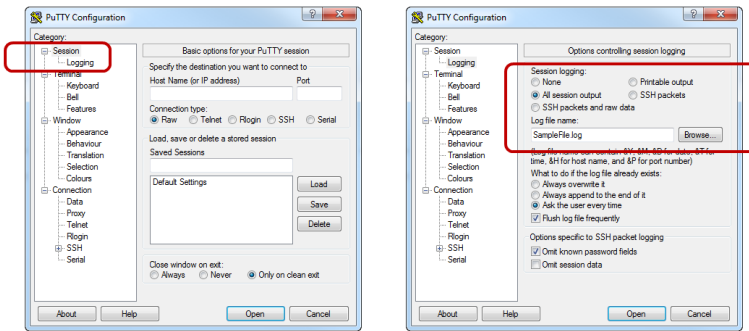


2. In the *PuTTY Configuration* window:

- a. Enter the analyzer IP address (from Step 1) into the PuTTY application.
- b. Enter 54000 (for Flex) or 54101 (for ASAP 2020) in the *Port* field.
- c. Select *Raw* as the connection type.



3. To save the settings (optional):



- a. In the *Category* box, select **Session > Logging**.
 - b. In the *Session logging* group box, select *All session output*.
 - c. In the *Log file name* group box, click **Browse** to select the destination and enter a .txt file name. It may be helpful to name this file the same as the sample file to be analyzed.
4. Click **Open** to start collecting the data.



The PuTTY application can be started before the analyzer starts collecting data — it will be *waiting* until data output from the analyzer begins.

ACCESS THE DATA LOG FILE

The text file created in the previous section (Step 3c) contains the transient data and can be accessed using any means that accepts tab separated value such as Notepad, Microsoft Excel (or other spreadsheet software), or programming languages that read .txt or .xls files such as MATLAB, Octave, and Python. MATLAB has the *xlsread()* function and Octave has the *textread()* function.

DATA FILE COLUMN DESCRIPTIONS

When the data file is viewed in a spreadsheet program, the following columns display:

- A. 'manifold pressure (Torr)';
- B. 'manifold vacuum (Torr)';
- C. 'time (ms)';
- D. 'port 1 temperature (C)';
- E. 'port 2 temperature (C)';
- F. 'port 3 temperature (C)';
- G. 'port 4 temperature (C)';
- H. 'port 5 temperature (C)';
- I. 'port 6 temperature (C)';

INSTALL PYTHON COMPONENTS

To operate Python to view real time data, three components should be installed in the following order:

1. Install PYTHON

- Download URL: <https://www.python.org/downloads/>
- Download Python version 3.2 or later

Depending on the computer operating system, download file versions may vary, however, the .msi file should be compatible with computers that operate the Flex or ASAP analyzer.

2. Install NumPY (for numerical functions)

- Download URL: <http://sourceforge.net/projects/numpy/files/NumPy/1.6.2/>
- Download file: numpy-1.6.2-win32-superpack-python3.2.exe

NumPY contains numerous numerical functions and libraries needed to properly handle the transient data extracted from the .txt file collected during an analysis. NumPY version 1.6.2 should be download to be compatible with the installed version of Python.

3. Install MatPlotLIB (for graphical display of the data)

- Download URL: <http://www.lfd.uci.edu/~gohlke/pythonlibs/#matplotlib>
- Download file: matplotlib-1.2.1rc1.win32-py3.2.exe

MatPlotLIB version 1.2.1 is compatible with NumPY from Step 2.

SAMPLE PYTHON CODE

The following code can be used to produce a plot of pressure versus time. This is the most basic code needed to see transient data, but the flexibility exists to script a more detailed file allowing for flexibility such as comparing temperature between ports, generating a separate figure for each port, etc.

```
import numpy as np
import matplotlib.pyplot as plt

myFile = 'carbon.txt'
data = np.genfromtxt(myFile, skip_header=2, skip_footer = 1)

# Time (minutes)
x=data[:,2]
x = x/1000/60

# Pressure (Torr)
y=data[:,0]

plt.plot(x,y,'ko')
plt.ylabel('Pressure (Torr)')
plt.xlabel('time (minutes)')
plt.show()
```

SAMPLE CODE EXPLANATION

```
import numpy as np
import matplotlib.pyplot as plt
```

Import is needed to load the modules containing functions to be used — in this case, numerical and plotting functions. Coding is easier if abbreviations such as *np* and *plt* are used.

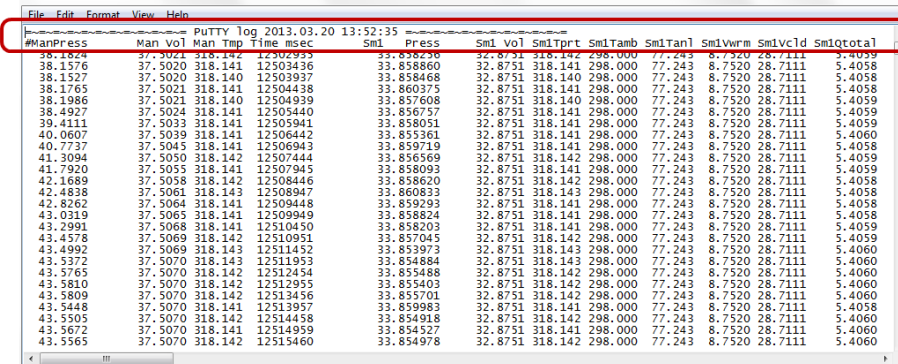
```
myFile = 'carbon.txt'
data = np.genfromtxt(myFile, skip_header=2, skip_footer = 1)
```

MyFile is a variable name for the .txt file to be read. As long as the .txt file and the script file are in the same directory, the script file can run automatically by double-clicking the script file after the correct file has been hard-coded.

The *genfromtxt()* function allows for the text file to be converted into a numerical matrix.

The *skip_header* setting allows for the first 2 rows of data to be excluded from the matrix. As shown in the following figure, the first row of data is ASCII *art* created by the PuTTY program, and the second row of data are the column labels — neither of which are numerical data.

The `skip_footer` setting is needed because, when the .txt file is read in real time, the entire last row of data may not be complete. This causes problems for creating the matrix and needs to be excluded. This means that the last half-second of data is not displayed when the data are viewed in real time.



| # | ManPress | Man vol | Man Tmp | Time msec | Sm1 | Press | Sm1 vol | Sm1Tpr | Sm1Tamb | Sm1Tan1 | Sm1Vwm | Sm1vld | Sm1total |
|---------|----------|---------|----------|-----------|---------|---------|---------|--------|---------|---------|--------|--------|----------|
| 38.1524 | 37.5021 | 318.142 | 12502955 | 33.858236 | 32.8751 | 318.142 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4059 | | |
| 38.1576 | 37.5020 | 318.141 | 12503436 | 33.858860 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4058 | | |
| 38.1527 | 37.5020 | 318.140 | 12503937 | 33.858468 | 32.8751 | 318.140 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4058 | | |
| 38.1765 | 37.5021 | 318.141 | 12504438 | 33.860375 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4058 | | |
| 38.1986 | 37.5021 | 318.140 | 12504939 | 33.857608 | 32.8751 | 318.140 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4059 | | |
| 38.4927 | 37.5024 | 318.141 | 12505440 | 33.856757 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4059 | | |
| 39.4111 | 37.5033 | 318.141 | 12505941 | 33.858051 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4059 | | |
| 40.0607 | 37.5039 | 318.141 | 12506442 | 33.853361 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4060 | | |
| 40.7737 | 37.5045 | 318.141 | 12506943 | 33.859719 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4058 | | |
| 41.3094 | 37.5050 | 318.142 | 12507444 | 33.856569 | 32.8751 | 318.142 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4059 | | |
| 41.7920 | 37.5055 | 318.141 | 12507945 | 33.858093 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4059 | | |
| 42.1689 | 37.5058 | 318.142 | 12508446 | 33.858620 | 32.8751 | 318.142 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4058 | | |
| 42.4838 | 37.5061 | 318.143 | 12508947 | 33.860833 | 32.8751 | 318.143 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4058 | | |
| 42.8262 | 37.5064 | 318.141 | 12509448 | 33.859293 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4058 | | |
| 43.0319 | 37.5065 | 318.141 | 12509949 | 33.858824 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4058 | | |
| 43.2991 | 37.5068 | 318.141 | 12510450 | 33.858203 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4059 | | |
| 43.4578 | 37.5069 | 318.142 | 12510951 | 33.857045 | 32.8751 | 318.142 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4059 | | |
| 43.4992 | 37.5069 | 318.143 | 12511452 | 33.853973 | 32.8751 | 318.143 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4060 | | |
| 43.5372 | 37.5070 | 318.143 | 12511953 | 33.854884 | 32.8751 | 318.143 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4060 | | |
| 43.5765 | 37.5070 | 318.142 | 12512454 | 33.855488 | 32.8751 | 318.142 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4060 | | |
| 43.5810 | 37.5070 | 318.142 | 12512955 | 33.855403 | 32.8751 | 318.142 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4060 | | |
| 43.5809 | 37.5070 | 318.142 | 12513456 | 33.855701 | 32.8751 | 318.142 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4060 | | |
| 43.5448 | 37.5070 | 318.141 | 12513957 | 33.859983 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4058 | | |
| 43.5505 | 37.5070 | 318.142 | 12514458 | 33.854918 | 32.8751 | 318.142 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4060 | | |
| 43.5672 | 37.5070 | 318.141 | 12514959 | 33.854527 | 32.8751 | 318.141 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4060 | | |
| 43.5565 | 37.5070 | 318.142 | 12515460 | 33.854978 | 32.8751 | 318.142 | 298.000 | 77.243 | 8.7520 | 28.7111 | 5.4060 | | |

Exclude the first two rows of data

Sample of Transient Data

```
# Time (minutes)
x=data[:,2]
x = x/1000/60
```

[Data File Column Descriptions on page 7 - 3](#) identifies the columns of data recorded. The fourth column of data contains time in milliseconds, however, the first index in Python is 0; therefore, `data[:,3]` captures all of the rows (:) in the fourth column.

```
plt.plot(x,y,'ko')
plt.ylabel('Pressure (Torr)')
plt.xlabel('time (minutes)')
plt.show()
```

The above code shows the syntax for plotting. The label 'ko' indicates filled black circles.



EU DECLARATION OF CONFORMITY

This declaration of conformity is issued under the sole responsibility of the manufacturer:

Micromeritics Instrument Corporation
4356 Communications Drive
Norcross, GA 30093, USA

Hereby declares that the product:

Smart VacPrep Sample Preparation Device

is in conformity with the following **EU harmonization legislation**:

2014/35/EU - LVD Directive
2014/30/EU - EMC Directive
2011/65/EU - RoHS Directive

and that the equipment is in conformity with the following harmonized and other appropriate standards;

2014/35/EU (LVD)

IEC 61010-1:2010/A1:2016 - *Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements.*

IEC 61010-2-010:2019 - *Particular requirements for laboratory equipment for the heating of materials.*

IEC 61010-2-081:2019 - *Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes*

2014/30/EU (EMC)

IEC 61326-1:2020 - *Electrical equipment for measurement, control and laboratory use — EMC requirements — Part 1: General requirements*

IEC 61000-3-2:2014 - *Part 3-2: Limits — Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC N 61000-3-3:2013 - *Part 3-3: Limits — Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*

2011/65/EU (RoHS)

EN 63000:2018 - *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*

Name: John McCaffrey, Ph.D.

Title: Vice President, R & D

Signature: 

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